SOLAR OBSERVATIONS.

SOLAR AND SKY RADIATION MEASUREMENTS.

By HERBERT H. KIMBALL, in Charge, Solar Radiation Investigations.

INSTRUMENTS AND EXPOSURES.

The measurements of direct solar radiation summarized in Table 1 are made with a Marvin pyrheliometer, which is described in the REVIEW for November, 1919, **47**:769. The measurements of the solar and sky radiation received on a horizontal surface summarized in Table 2 are obtained at Madison, Wis., and Lincoln, Nebr., by means of a Callendar recording pyrheliometer, which is described in the REVIEW for August, 1914, **42**:474. At Washington, D. C., and Chicago, Ill., they are obtained by means of a thermoelectric recording pyrheliometer, which is described in the REVIEW for May, 1923, **51**:239–242.

A description of the exposures of the Marvin pyrheliometers, and the method of obtaining solar radiation intensities at the desired zenith distances of the sun, is given in the REVIEW for January, 1916, **44**:2. The Callendar pyrheliometers at Lincoln and Madison are exposed as described in the REVIEW for April, 1916, **44**:179 and 180, respectively, except that at Madison the dome and flagstaff on University Hall no longer shade the pyrheliometer at certain times as formerly. Callendar receiver No. 9864 is still in use at Madison, but the receiver at Lincoln was replaced by No. 13129, formerly in use at Washington, on November 7, 1922. Thermoelectric pyrheliometer No. 5, in use at Washington, is exposed on the capstone of a ventilating flue of the College of History Building, American University, at a height of 451 feet, or 137 meters, above sea level, which is the exposure formerly given the Callendar pyrheliometer. A description of the exposure of thermoelectric pyrheliometer No. 6 at the Weather Bureau Observatory, Chicago University, is given in the REVIEW for October, 1923, **51**:533–534.

In the REVIEW for January, 1916, **44**:3, is given a description of the exposure of the Pickering polarimeter employed at Washington for measuring skylight polarization, and also an account of the manner in which the measurements are made. The exposure of a similar instrument in use at Madison is described in the REVIEW for January, 1917, **45**:2.

MEASUREMENTS DURING JANUARY, 1924.

From Table 1 it will be seen that solar radiation intensities were generally below normal at Washington and above normal at Lincoln. At Madison but few measurements were obtained during the month on account of poor sky conditions.

Table 2 shows an excess in the total radiation received on a horizontal surface, most pronounced at Lincoln, least pronounced at Madison.

Skylight polarization measurements obtained at Washington on 11 days give a mean of 56 per cent with a maximum of 67 per cent on the 11th. The latter is close to the average maximum for January, but 56 per cent is below the January average. At Madison the ground was covered with snow throughout the month which explains the low polarization value of 51 per cent obtained on the 3d.

TABLE 1.—*Solar radiation intensities during January, 1924.*

[Gram-calories per minute per square centimeter of normal surface.]

Washington, D. C.

Date.	Sun's zenith distance.									
	8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon.
	75th mer. time.	Air mass.									Local mean solar time.
		A. M.					P. M.				
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
1924.	*mm.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Jan. 4	2.36	0.57	0.71	0.85							2.36
7	2.06				1.31			1.02	0.86	0.77	1.37
8	2.49	0.76	0.88	1.01	1.16			1.04	0.85	0.74	3.15
9	4.37	0.69	0.81	0.99	1.22	1.47		0.97	0.82	0.69	3.45
11	13.61					1.61	1.35	1.12	0.95	0.81	7.29
12	3.45	0.70	0.81	1.00	1.16			0.94	0.78	0.62	3.30
14	2.16	0.49	0.64	0.79			1.02	0.78	0.64	0.43	2.26
15	2.49				1.13						3.15
17	3.99	0.56	0.68	0.82							3.63
18	3.63		0.44	0.57							3.63
21	0.64	0.85	0.89	1.12			1.16	0.96	0.78	0.63	0.46
23	2.06				1.25		1.26				1.96
25	4.95						1.29				6.02
26	0.96	0.88	0.99	1.21	1.39	1.59	1.39	1.09	0.92		1.24
28	1.78	0.39	0.43	0.62	1.04						2.16
Means		0.65	0.73	0.90	1.21		1.24	0.99	0.82	0.67	
Departures		−0.09	−0.11	−0.09	−0.02		+0.02	−0.03	−0.04	−0.11	
Madison, Wis.											
Jan. 3	0.66			1.24							0.79
21	0.25			1.20							0.28
25	0.80							1.27			0.58
Means				(1.22)				(1.27)			
Departures				−0.02				+0.03			
Lincoln, Nebr.											
Jan. 2	1.52					1.49	1.33	1.18	0.93		1.60
4	0.74	1.07	1.18	1.34	1.52	1.73					0.79
5	0.36							1.19	1.03		0.64
12	1.07		1.20	1.33	1.48			1.23	1.04	0.76	1.24
16	0.56			1.30	1.47						1.19
17	0.79	0.93	1.08	1.25	1.46						2.36
19	1.19							1.32	1.11	1.03	0.96
23	3.00						1.28	1.11	0.95	0.73	3.45
29	3.45				1.38		1.40				4.57
Means		(1.00)	1.15	1.30	1.46		1.34	1.21	1.01	0.84	
Departures		+0.08	+0.12	+0.13	+0.09		+0.08	+0.02	−0.03	−0.07	

* Extrapolated.

TABLE 2.—*Solar and sky radiation received on a horizontal surface.*

Week beginning.	Average daily radiation.				Average daily departure for the week.			Excess or deficiency since first of year.		
	Chicago.	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.
1924.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Jan. 1	106	139	160	220	−14	+19	+30	− 96	+130	+213
8	84	190	126	178	+31	−27	−20	+121	− 57	+ 70
15	96	142	188	261	−26	+21	+51	− 62	+ 93	+427
22	115	228	194	231	+50	+ 9	+ 3	+286	+153	+445